REMARKS

By the above amendment, the Cross Reference to Related Application has been updated, claim 6 has been canceled, claims 7 and 8 have been amended to clarify the recited features and new claims 9-19 have been presented, wherein claims 9-13 depend directly or indirectly from claim 7 and claims 14-19 depend directly or indirectly from claim 8.

As to the objection to claim 7 regarding the informality noted, by the present amendment, the objected to language has been deleted.

Turning to the rejection of claims 6-8 under 35 U.S.C. 102(b) as being anticipated by Le et al (US Patent No. 6,153,115), this rejection is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejection are respectfully requested.

At the outset, as to the requirements to support a rejection under 35 U.S.C. 102, reference is made to the decision of In re Robertson, 49 USPQ 2d 1949 (Fed. Cir. 1999), wherein the court pointed out that anticipation under 35 U.S.C. §102 requires that each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. As noted by the court, if the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if the element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Moreover, the court pointed out that inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

Applicants note that conventionally, in order to determine or detect an end point of the plasma process such as etching process, principal component analysis or multivariate statistical analysis is made for the plasma radiation emitted from a

vacuum process chamber to extract changes of the characteristic values of the plasma radiation by using a weighting function thereby to determine the end point in a manner such as disclosed in the cited Le et al patent with regard to Fig. 4 and other drawings thereof. However, with such disclosed operation as in Le et al, random noise can not be removed sufficiently form the measured values, and therefore the end point can not be determined or detected with sufficient accuracy.

The present invention is directed to sufficiently removing random noise so as enable determination or detection of the end point with sufficient accuracy. The inventors of the present invention determined that the changing manner of intensities of the emission spectra in the course of plasma (etching) process when the etching of the materials to be etched is almost terminated differs depending on kinds of materials within the vacuum process chamber and found an end point determining method in which the random noise can be removed effectively. More particularly, the inventors of the present invention recognized that intensities of the emission spectra in the course of plasma (etching) process when the etching of the materials to be etched is almost terminated increases as to one of the predetermined plural kinds of materials within the vacuum process chamber and decreases as to another of the predetermined plural kinds of materials within the vacuum process chamber. Thus, the inventors determined that for each of the predetermined plural kinds of materials within the vacuum process chamber, when the digital signals of a set of wavelengths corresponding to a set of emission spectrum wavelengths intrinsic to the material are added (in the positive direction or negative direction), the random noise can be eliminated effectively so as to enable accurate determination of the end point which features are now set forth in independent claims 7 and 8 and the dependent claims. (See step d of claims 7 and 8 and substeps d1 and d2 of dependent claims 9 and 14, for example. Applicants submit that such features are not disclosed by Le et al in the sense of 35 U.S.C. 102 and all claims should be considered allowable thereover.

Further, as described at pages 31-34 of the specification, the inventors determined that as to still another of the plural kinds of materials which intensities of emission spectra do not substantially change before and after the end point of the predetermined plasma process, when digital signals of a set of wavelengths corresponding to a set of emission spectrum wavelengths intrinsic to the still another material are added, the random noise can be eliminated effectively to enable accurate determination of the end point, which features are recited in dependent claims 10 and 16. Applicants submit that the aforementioned features are not disclosed by Le et al and such claims should be considered allowable thereover.

Additionally, as described at pages 31-34 of the specification and as recited in step e of independent claim 8 and the dependent claims, when performing adding or subtracting operation between the added signals obtained in step d) as to at least two of the predetermined plural kinds of materials, the random noise can be eliminated more effectively so as to make it possible to more accurately determine the end point. Dependent claim 15 recites substeps of step e including:

"e1) performing an adding process between said added signals obtained in said step d) as to one of said plural kinds of materials which intensities of emission spectra decrease at substantially the end point of the predetermined plasma process and said added signals obtained in said step d) as to another of said plural kinds of materials which intensities of emission spectra decrease at substantially the end point of the predetermined plasma process; or

e2) performing an adding process between said added signals obtained in said step d) as to one of said plural kinds of materials which intensities of emission spectra increase at substantially the end point of the predetermined plasma process and said added signals obtained in said step d) as to another of said plural kinds of materials which intensities of emission spectra increase at substantially the end point of the predetermined plasma process; or

e3) performing a subtracting process between said added signals obtained in said step d) as to one of said plural kinds of materials which intensities of emission spectra decrease at substantially the end point of the predetermined plasma process and said added signals obtained in said step d) as to another of said plural kinds of materials which intensities of emission spectra increase at substantially the end point of the predetermined plasma process" (emphasis added);
and applicants submit that Le et al fails to disclose the aforementioned recited features.

Applicants note that as to two kinds of materials such as reaction products each of which intensities of emission spectra decrease at substantially the end point of the predetermined plasma process, an adding process is performed between the two added digital signals each being of a set of wavelengths corresponding to a set of emission spectrum wavelengths intrinsic to the material for the kinds of materials. Similarly, as to two kinds of materials such as radicals each of which intensities of emission spectra increase at substantially the end point of the predetermined plasma process, an adding process is performed between the two added digital signals each being of a set of wavelengths corresponding to a set of emission spectrum wavelengths intrinsic to the material for the kinds of materials.

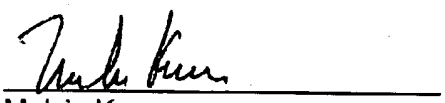
Furthermore, as to two kinds of materials one of which intensities of emission spectra increase while the other of which intensities of emission spectra decrease at substantially the end point of the predetermined plasma process, a subtracting process is performed between the two added digital signals, each being of a set of wavelengths corresponding to a set of emission spectrum wavelengths intrinsic to the material for the kinds of materials. Thus, the inventors have determined that intensities of the emission spectra in the course of plasma etching process can be classified into (1) spectra due to the reaction products which decrease at the time point when the etching of the materials to be etched is terminated, (2) spectra due to the radicals which increase at the end point of the etching, and (3) spectra due to

materials irrelevant to the etching reaction and undergoing no change before and after the end of the etching (i.e., around the end point of etching) (see page 31, lines 12-21 of the specification), and then performs the adding or subtracting process selectively based on the two of the plural kinds of the materials using a mask function M(λ) (see page 32 of the specification), thereby effectively eliminating the random noise to detect the end point more accurately (see page 32, line 8 to page 34, line 8 of the specification). Additionally, the inventors proposed the dividing process for canceling out fluctuations of emission spectra possibly brought about by abnormal electric discharge (see dependent claims 11, 16: page 39, line 17 to page 40, line 24 of the specification). Applicants submit that irrespective of the position set forth by the Examiner, Le et al fails to disclose or teach the aforementioned recited features as now recited in claims 7-19 of this application and all claims should be considered allowable thereover.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance, and issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (500.41316VX1) and please credit any excess fees to such deposit account.

Respectfully submitted,



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